

## Hatchery system evaluation and adaptation for the production of *Oreochromis karongae* (Trewavas, 1941) fingerlings

Valeta, J. S.<sup>1</sup>, Likongwe, J.S.<sup>1</sup>, Kassam, D.<sup>1</sup> & Matiya, G.<sup>1</sup>

<sup>1</sup>University of Malawi, Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi

Corresponding author: georgematiya@yahoo.co.uk

### Abstract

In Malawi development of aquaculture is constrained by, among other factors, lack of good quality seed. Through Research into Use (RiU) the Government of Malawi has mandated a few fish hatcheries, of which the most prominent is the Commercial Tilapia Hatchery at The National Aquaculture Center (NAC), Domasi, Zomba to produce seed. However, this state of the art hatchery, based on technology from Thailand, faces challenges in the production of consumer preferred *Oreochromis karongae* fingerlings. This study seeks to evaluate the hydraulic, economic and biological characteristics of the system and adapt it for the successful production of *O.karongae* fingerlings.

Key words: Fingerlings, fish hatchery, fry rearing, Malawi, *Oreochromis karongae*

### Résumé

Au Malawi le développement de l'aquaculture est contraint, parmi tant d'autres facteurs, par le manque de graine de bonne qualité. Par le canal de RiU (Research into Use: recherche dans l'utilisation), le gouvernement du Malawi a exigé quelques établissements d'incubation de poissons, dont le plus proéminent est l'établissement d'incubation commercial de Tilapia au centre national d'aquaculture (NAC) à Domasi- Zomba pour produire la graine. Cependant, cet établissement d'incubation de haute performance, basé sur la technologie thaïlandaise, relève des défis dans la production des poissons jeunes *Oreochromis karongae* préférés par le consommateur. Cette étude vise à évaluer les caractéristiques hydrauliques, économiques et biologiques du système et à l'adapter pour la production réussie des poissons jeunes *Oreochromis karongae*.

Mots clés: Jeunes poissons, incubateur des poissons, culture des alevins, Malawi, *Oreochromis karongae*.

### Background

Global trends show declining catches of a few important species. In Malawi, some important fish species such as *Oreochromis karongae* (chambo) have been overfished from the natural

waters, including Lake Malawi, the main source (Kaunda et al., 2005). Aquaculture has potential to both supplement and complement fish production from capture fisheries. Among the aquaculture species in Malawi, *O. karongae* is preferred by consumers and fish farmers, for its superior growth characteristics. The commercial Tilapia Hatchery established at the National Aquaculture Center, however, produces only few *O.karongae* fingerlings owing to high mortalities during egg incubation and fry rearing.

This study therefore aims at under studying the hatchery system in place so as to effect changes that would adapt the microclimate in the recirculating system, from filtration to disinfection and sterilization of the system and hydraulic configurations, as well as egg production, incubation and fry rearing processes.

### Literature Summary

*Oreochromis karongae* is one of the indigenous *Tilapia* species exhibiting favourable traits for aquaculture in Malawi. They are capable of breeding several times in a year, but produce few fingerlings (Msiska, 1999). This limited availability of seed is the main reason for limited production of *O.karongae* amongst farmers. This can be due to lack of culture facilities for most farmers. Furthermore, *O. karongae* requires high level of management. Successful breeding in the hatchery should either mimic environmental conditions or, based on the understanding of the natural environment, enhance the environment to improve breeding success (Msiska and Costa-Pierce, 1997). Water quality is known to affect the health and productivity of cultured organisms (Diana et al., 1997). Egg and embryo development, i.e., the period of hatching, depends on temperature (Stickney, 1994). The pH also affects hatchability and fry survival due to stress. It is also presumed that light also could influence hatchability in *O.karongae* (Msiska and Costa-Pierce, 1997).

### Study Description

The study will be carried out at the Commercial Tilapia Hatchery at the National Aquacultural Centre (NAC), in three phases. Two strains of *O.k.* will be collected from Maldeco Aquaculture Limited and NAC, respectively. Phase I will study the effect of feed quality (10, 20 and 30% crude protein) on fecundity, egg size and fry survival of the two *O.k.* strains, in 1m<sup>3</sup> tanks. This will also involve evaluation (technical and economic) of the Commercial Tilapia Hatchery. Phase II will encompass studies on egg hatchability and fry survival as affected by water flow rate (Q), temperature (T), pH, photoperiod (P) and incubation

density (D). Phase III will focus on studying the combined effect of Q, T and P on hatchability and fry survival, in a factorial experiment (3×2) laid in complete randomized design (CRD) in incubation jars and fry rearing trays, respectively, supported by a repeat of the feed quality experiment which will provide eggs for the study.

### Research Application

The study will produce an adapted hatchery system for the production of *Oreochromis karongae* fingerlings in Malawi, which will ensure increased production and availability of the seed to meet the demand. This will in the long run improve fish production in Malawi. It is also hoped that farmers wishing to venture into breeding of the fish will have readily available guidelines. Furthermore, this adaptation process may provide a background for adaptation of hatchery systems and programs for other Tilapine species in the tropics.

### Acknowledgement

We are grateful to the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) for the financial support towards the study and the Ministry of Agriculture and Food Security for accepting that the study be undertaken at NAC.

### References

- Diana, J.S., Szyper, J.P., Batterson, T.R., Boyd, C.E. and Piedrahita, R.H. 1997. Water quality in ponds. In: Egna, H.S. and Boyd, C.E. 1997. Dynamics of pond aquaculture. CRC Press, Florida. pp 53-71.
- Kaunda, E., Maliro, D., Mphepo, M., Khaila, S., Kamanga, L., Phiri, L.Y. and Valeta, J. 2005. Management regulations and enforcement in Malawi Fisheries. The Future of Smallholder Agriculture in Eastern Africa. S. Babu and A. Temu (Eds.). IFPRI, Kampala, Uganda. pp. 369-297.
- Msiska, O.V. and Costa-Pierce, B.A. 1997. Factors influencing the spawning success of *Oreochromis karongae* (Trewavas) in ponds. *Aquaculture Research* 28:87-99.
- Msiska, O.V. 1999. Maturity and gonad changes of *Oreochromis* (Nyasalapia) *karongae* in ponds in Malawi. *Journal of Applied Ichthyology* 15(3): 97-103.
- Stickney, R.R. 1994. Use of hatchery fish in enhancement programs. *Fisheries* 19:6-13.
- System Science Consultants Inc (SSC). 2005. National Aquaculture Strategic Plan (NASP) (2006–2015). Master Plan Study on Aquaculture Development in Malawi. Main Report. Japan International Cooperation Agency, Tokyo, Japan.